17. STORM 11-13 OCTOBER 2000 FOLLOW-UP REPORT - BEXLEY DRAINAGE SYSTEM

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The purpose of this report is to inform the Community Board of and seek support for flood damage reduction measures proposed for the Bexley area following a review of the drainage system carried out since the extreme storm experienced on 11 to 13 October 2000.

The Parks and Recreation Committee will consider a report on the Bexley, Heathcote and Ferrymead areas.

BEXLEY DRAINAGE SYSTEM

The Bexley drainage catchment comprises approximately 90 hectares of mostly low-lying land west of the Avon River between Carisbrooke Street and the recent Pacific Park subdivision. Land use is predominantly residential but the catchment includes Bexley Reserve (15 hectares).

Bexley is protected from tidal flooding from the Avon River by stopbank and internal catchment stormwater drainage is pumped over the stopbank from two pumping stations located at Waitaki Street and Wairoa Street. The Waitaki Street sub-catchment is drained by Knights Waterway and piped drain and the Wairoa Street sub-catchment by a piped stormwater network. The two sub-catchments merge during extreme storm events. An artificial wetland located on Knights Waterway provides water quality control and stormwater storage capacity.

Within the Christchurch context the risk of flood damage during extreme events is relatively high for Bexley because it is so low-lying and entirely dependent on engineering measures (that is, stopbanks and flood pumping) for protection.

AUGUST 1992 SNOW STORM AND SUBSEQUENT FLOOD DAMAGE REDUCTION MEASURES

Peak flood levels of RL 10.95m to 11.0m were reached in the Avon River above the Bridge Street bridge during the August 1992 storm. The stopbanks were overtopped and river overflows accumulated at the Waitaki Street/Bexley Road corner, eventually entering the dwelling at 1 Waitaki Street.

Subsequently the following measures to reduce flood damage risk were implemented:

1. Stopbanks throughout the lower Avon scheme area were raised. Filling up to 250mm depth was required in the Bexley area to achieve a stopbank crest level of RL 11.2m.

2. A critical manhole on Bexley Road towards Wainoni Road was modified to prevent backflow from the river onto Bexley Road.

3. A new debris grille less susceptible to blockage was installed at the Waitaki Street pumping station.

4. Inspection and maintenance procedures for critical debris grilles and outlet flapgates were improved.

5. The wetland on Knights Waterway was constructed to provide some stormwater storage and regulate flow to the Waitaki Street pumping station.

6. Cabbage trees in the streets were removed to reduce the risk of pump impellor blockage posed by cabbage tree leaves transported via the drainage system.

7. The dwelling at 1 Waitaki Street was raised above the 50-year flood level.

8. Connections for a portable generator were provided at both pumping stations. In the event of power outage during a storm alternative power can now be provided by portable generator.

9. SCADA (Supervisory, control and data acquisition) alarm systems have been installed. Water levels and pump operation at both pumping stations are now monitored continuously by this automatic remote system.

The sum total of these measures has significantly reduced the risk of major flood damage by floodwaters from either the Avon River or from internal catchment runoff. Thanks to the SCADA system with its alarms the risk of any malfunction at either pumping station going undetected is extremely low.

OCTOBER 2000 STORM

The October storm was an extreme event in terms of wind and rain depth and intensity falling in the southeast sector of the City including Bexley. The maximum recorded rainfall depth was 190mm in Bowenvale Valley. Estimated total rainfall depth over 36 hours for Bexley was 120mm. The 103mm recorded at Bridge Street rain gauge during the peak flow period equates to a 50-year return period (that is 2% annual exceedance probability (AEP)).

The sheer volume of runoff overwhelmed the capacity of Bexley's two pumping stations. Water ponded on streets up to a maximum depth of about 400mm and on private properties before it was discharged by the pumps.

Floodwater entered some garages and other outbuildings, but did not enter any dwelling. However, the anxiety, inconvenience, and section damage suffered by Bexley residents needs to be acknowledged.

Notwithstanding the extent of stormwater ponding the existing stormwater drainage system performed satisfactorily during a storm event, which was much bigger than the system was designed for. The system just meets the following City Council stormwater drainage standard:

1. Primary system conveys a 5-year flood (20% AEP) without overflowing.
2. No houses flooded in a 50-year (2% AEP) storm.

OPTIONS AND OPPORTUNITIES

Although Bexley's stormwater drainage system performed satisfactorily under the circumstances of the October 2000 storm, there is a community demand for an improved level-of-service, which could be facilitated by the imminent extension of the Burwood/Woolston Expressway through Bexley.

Options and opportunities for improving level-of-service including specific suggestions from the Bexley Residents' Association have been investigated and are discussed below:

1. **Sub-catchment diversion to Estuary Drain**

   The extension of the Burwood/Woolston Expressway adjacent to Bexley Road programmed for 2001/02 provides an opportunity to divert runoff from an area of up to nine hectares within the Bexley Reserve sub-catchment via an open waterway along the west edge of the expressway to Estuary Drain. Minor opportunities for stormwater detention may exist en route.

   Diversion of runoff from part of Bexley Reserve is being incorporated into the design of the expressway. The extent of diversion will be determined by expressway profile constraints and retaining an acceptable level of flood protection for the property at 184 Bexley Road.

   A second tidal flapgate will need to be installed upstream from Estuary Drain to reduce the risk of backflow from the Avon River.

   The effect of this diversion during the October 2000 storm would have been to reduce the maximum depth of street ponding of 400 mm by up to 100 mm and to reduce the duration of ponding.

   The preliminary cost estimate of additional drainage works associated with the expressway is $40,000.

   Also, the Bexley Reserve inlet to the Rowses Road piped stormwater system can be improved and the gas cut-off drain around the perimeter of the Reserve intercepted so that storm secondary flows from the Reserve into the Knights Drain system do not occur.

2. **Increase Pumping Capacity**

The Bexley Residents' Association have requested an increase in pumping capacity at the Waitaki Street pumping station for a number of years. Greater pumping capacity at either pumping station would have reduced the depth of ponding during the October 2000 storm. For example, for an increase of 300 litres/second capacity at Waitaki Street the maximum street ponding depth of 400 mm would have been reduced by approximately 100 mm and duration of ponding would have been reduced.

A comprehensive risk assessment of the two pumping stations and their operation during extreme storms has been commissioned. Improving station operational reliability may prove to be more effective than committing approximately $100,000 now to pumping capacity increase at Waitaki Street.

The question of pumping capacity will be reconsidered in light of the risk assessment to be completed this year.

3. **Minor Measures**

The lip of the Waitaki Street pumping station discharge chamber has been 140 mm lower than the Avon River stopbank crest since stopbank raising. Although there is a tidal flapvalve on the discharge pipeline to the river the chamber lip should be raised to reduce the small risk of backflow through the chamber from the Avon River. The lip can be raised by 100 mm without adversely affecting the operation of the existing pumps.

Inspection and maintenance schedules for pipe outlets to the Avon River have been reviewed and appropriate modifications made.

A debris grille will be installed immediately downstream from the wetland on Knights Waterway at the time of expressway construction to reduce the amount of litter and debris reaching Waitaki Street pumping station. The grille will be added to the "critical" list for maintenance purposes.

An existing 225 mm diameter pipe along Pages Road entering the two sub-catchments will be severed to eliminate this preferred path for storm secondary flows.

4. **City Plan Variation**

The proposal City Plan variation to set minimum development levels in coastal areas including Bexley and floodplains will reduce flood damage in the long term if adopted. The variation seeks to set minimum floor levels for new buildings at RL 11.8m which is expected to provide a high level of protection in the face of rising sea levels.

5. **Waterway Piping**

The remaining life in the timber lining on Knights Waterway between the Burwood/Woolston expressway corridor is five years or less. Lining replacement by piping is programmed for 2002/03 (Preliminary estimate $130,000). Although waterway piping is not specifically a flood damage reduction measure it will assist in flow regulation to the Waitaki Street pumping station.

SUMMARY AND CONCLUSIONS

Although the October 2000 storm was an extreme event for the Bexley area with floodwater ponding up to 400 mm deep the drainage system performed satisfactorily. Water did not enter any dwellings.

Extension of the Burwood/Woolston Expressway through Bexley during 2001/02 provides the opportunity to improve the drainage level-of-service by directing runoff from part of Bexley Reserve along the edge of the expressway to Estuary Drain.

The suite of flood damage reduction measures identified for implementation during 2001/02 comprise:

- Sub-catchment diversion to Estuary Drain.
- Improved capture of Bexley Reserve runoff into the Rowses Road stormwater system.
- Raising the lip of the Waitaki Street pumping station discharge chamber.
- Improved inspection and maintenance schedules.
- Installation of a debris grille on Knights Waterway.
- Severing the small diameter sub-catchment connection pipe on Pages Road.

Pumping capacity will be reviewed after the pumping stations risk assessment has been completed.

The proposed City Plan variation addresses flood damage risk to new development in the catchment.

Recommendation: That the Board support the suite of flood damage reduction measures described in this report for the Bexley area.

Chairperson's Recommendation: That the abovementioned recommendation be adopted.